

REMARKS

This Amendment is submitted in reply to the final Office Action mailed on December 4, 2008. A request for continued examination ("RCE") is submitted herewith. The Director is authorized to charge \$405.00 for the RCE and any additional fees that may be required, or to credit any overpayment to Deposit Account No. 02-1818. If such a withdrawal is made, please indicate the Attorney Docket No. 112843-001 on the account statement.

Claims 13-29, 31-33, 35-41 and 44-52 are pending in this application. Claims 1-12, 30, 34 and 42-43 were previously canceled. In the Office Action, Claims 13-29, 31-33, 35-41 and 44-52 are rejected under 35 U.S.C. § 103. In response, Claims 13 and 49 have been amended. The amendments do not add new matter. In view of the amendments and/or for the reasons set forth below, Applicants respectfully submit that the rejections should be withdrawn and the application now passed to allowance.

In the Office Action, Claims 13-29, 31-33, 35-37, 44-45 and 49-52 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,300,398 to Jialanella ("*Jialanella*") in view of the publication on Polywax Polyethylene ("*Baker-Hughes*"). In contrast, Applicants respectfully disagree with and traverse the rejection for at least the reasons set forth below.

Applicants have amended independent Claim 13 to recite, in part, that the polymer mixture in the form of a thermoplastic melt is prepared by a means selected from the group consisting of a dispersively and distributively acting mixing system, a double-screw extruder, a single-screw extruder with mixing section, a Buss-Ko kneader and combinations thereof. The amendments are supported in the U.S. publication 2006/0148960 at paragraph 23 and Claim 49. Independent Claim 13 further recites, in part, a second polymer P(j) made up of the same monomer units as the sequences A of P(i) having a degree of polymerisation DP(P(j)) of P(j) of $20 < DP(P(j)) < 500$, a polydispersity < 30 P(j) and a degree of branching $< 5 \times 10^{-2}$. In contrast, Applicants respectfully submit that the cited references alone or in combination fail to disclose or suggest each and every element of independent Claim 13.

Embodiments of the present disclosure are directed to polymer mixtures containing at least one synthetic first polymer P(i) and at least one second polymer P(j) having specific characteristics wherein the structural parameters of the two polymers are coordinated in such a way that an improved polymeric material is obtained. The improved polymer mixture is easier to

process and provides improved mechanical properties and improved thermal properties as compared to the first polymer alone under suitable conditions for producing the polymer mixture.

Jialanella and *Baker-Hughes* fail to disclose or suggest a polymer mixture comprising a second polymer P(j) made up of the same monomer units as the sequences A of P(i) having a degree of polymerisation DP(P(j)) of P(j) of $20 < DP(P(j)) < 500$, a polydispersivity < 30 P(j) and a degree of branching $< 5 \times 10^{-2}$ as required by independent Claim 13. *Jialanella* and *Baker-Hughes* also fail to disclose or suggest that the polymer mixture in the form of a thermoplastic melt is prepared by a means selected from the group consisting of a dispersively and distributively acting mixing system, a double-screw extruder, a single-screw extruder with mixing section, a Buss-Ko kneader and combinations thereof as required by independent Claim 13. Moreover, the Patent Office has failed to provide any support within *Jialanella* or *Baker-Hughes* showing these elements.

“One way for a patent applicant to rebut a prima facie case of obviousness is to make a showing of ‘unexpected results,’ i.e., to show that the claimed invention exhibits some superior property or advantage that a person of ordinary skill in the relevant art would have found surprising or unexpected.” *In re Soni*, 54 F.3d 746, 750 (Fed. Cir. 1995). Applicants have surprisingly found that a synergistic interaction of at least two specifically recited polymers takes place. The claimed polymer mixtures results in a macromolecular network that is created by a kind of crystallization where the resulting crystals are built from the polymer macromolecules as well as wax molecules such that an improved processability can be combined with improved mechanical properties.

In Figure 3 of Applicants’ specification, the elongation at break using different mixers is shown for some samples according to the claimed polymer mixture containing wax. Using a twin screw extruder, which has the best mixing performance, the elongation at break does not decrease in the range of about 0 – 15% added wax. On the other hand, if a single screw extruder or a Brabender kneader (5 min mixing time) is used, as both are capable of only limited mixing performance, the elongation at break decreases already at minor amounts of wax. The situation can be improved a bit, if the Brabender kneader is operated for a longer time as 15 minutes since the mixing performance gets a bit better, but nevertheless is still limited compared to a twin

screw extruder where a much better mixing performance can be achieved at typical mixing times in the range of 30 seconds.

Applicants respectfully submit a Declaration under 37 C.F.R. §1.132 ("*Declaration*" attached hereto as Attachment 1) showing that the improved polymer mixture of the present claims has unexpected results that are distinguishable from the polymer compositions of *Jialanella* and that the skilled artisan would not have arrived at the claimed polymer mixture using the cited references. As supported by the *Declaration*, the skilled artisan reading *Jialanella* would be taught to make a polymer composition by either combining wax with a suitable nucleating agent or avoiding wax for at least two reasons: (i) the adverse effect of wax on elongational properties and (ii) *Jialanella's* teaching that the wax should have a greater density than that of *Jialanella's* interpolymers. A greater density reflects a higher melting point. In this regard, the skilled artisan would understand that the processability is aggravated because a higher melting temperature has to be reached.

Jialanella is directed to polymer compositions comprising a homogeneous linear or substantially linear ethylene polymer ("*interpolymer*"). See *Jialanella*, column 1, lines 7-8. *Jialanella* teaches that with decreasing density the elongation properties of the interpolymers increase, which is desired, but the upper use temperature and the onset of crystallization temperature decrease, which is not desired. See *Jialanella*, column 1, lines 17-24. As a result, *Jialanella* is directed to a solution to this problem. Practically, the onset of crystallization of the interpolymers can be as low as 40°C. Even at 25°C crystallization is not completed. To complete crystallization, cooling until below 0°C would be necessary but this is not feasible because much of the crystallinity would melt again at room temperature. Thus, the low upper use temperature and the low onset of crystallization are problematic. The interpolymers can be regarded as being in a partially molten state at room temperature.

Jialanella teaches that if a higher density crystallinity material such as a higher density homogeneous ethylene polymer or a traditional wax is added to the polymer composition, the problem with the crystallinity would be compensated but at the same time a highly deleterious loss of elongation properties is obtained. See *Jialanella*, column 1, lines 25-35. Good elongational properties are exactly the reason why the interpolymers are useful. *Jialanella* clearly teaches that adding a wax leads to a break down of the elongational properties, which

teaches away from the claimed polymer mixture. As supported by the *Declaration*, the deleterious loss of elongational properties pointed out by *Jialanella* definitely does not occur with the claimed polymer mixture. This is due to the specific network of the claimed polymer mixture that is obtained from truly molecularly disperse mixture.

Jialanella further fails to disclose any specific requirements of the mixing process. Instead, the liquids of *Jialanella* are mixed by a Haake mixer or a Banbury mixer. See *Jialanella*, column 20, line 42. The mixers are conventional batch mixers like the Brabender chamber kneader used in a comparative example in the pending application. Such mixers are known to be on the low end side regarding mixing performance. For mixing of systems that are difficult to mix (e.g. systems comprising long and short chain polymers) unusual and impractical long mixing times are required and even at longest times the obtainable results are limited. According to *Jialanella*, the liquids are mixed for just 2 minutes. See *Jialanella*, column 20, line 64 to column 21, line 1.

As supported by the *Declaration*, the skilled artisan would understand that the polymer compositions of *Jialanella* are distinguishable from the claimed polymer mixtures. *Jialanella* uses compositions comprising a homogeneous ethylene interpolymer, a wax and a nucleating agent. See *Jialanella*, column 1, lines 57-59. The deleterious effect of the wax, which is a high crystallinity material, is overcome by using an effective amount of nucleating agent. See *Jialanella*, column 1, lines 60-64. From this, the skilled artisan would understand that by adding wax the upper use temperature and the onset of crystallization temperature can be improved towards higher values and that the deleterious negative effect of the wax on elongational properties can be overcome by simultaneously using an appropriate amount of nucleating agent. As a result, this would confirm the skilled artisan's understanding that wax as a short chain molecule has an adverse effect on elongational properties as it is clear that the good elongational properties of polymers are a direct consequence of the unique feature of polymers: the long chain. The fact that the nucleating agent increases the elongation at break by a factor of at least four, as is pointed out in column 2, lines 20-23, is very surprising indeed and comprises the essential teaching of *Jialanella*.

As supported by the *Declaration*, the skilled artisan would not conclude from the use of soft coatings and hot melt adhesives containing wax and nucleating agent (as taught by

Jialanella) that adding a wax to achieve a higher density, rigid polymer would obtain articles with maintained or improved properties. Instead, the skilled artisan would expect a break down of the properties of the polymer, particularly of the elongational properties.

Interpolymers according to *Jialanella* have densities in g/cm^3 less than 0.910, most preferably less than 0.880. See *Jialanella*, column 1, lines 14-16. All the examples of such interpolymers in *Jialanella* have densities in the range $0.86 - 0.89\text{g/cm}^3$. See *Jialanella*, Table 1. The skilled artisan understands these interpolymers as very soft materials having E-moduli in the range of typically 5 MPa while a typical LDPE has an E-modulus of 400 MPa and a typical HDPE has an E-modulus of about 700 MPa. Typical applications of such polymers compositions are in the field of high speed coatings (of fabrics, carpet backing, floor tile, and sheeting) and hot melt adhesives. See *Jialanella*, abstract.

As supported by the *Declaration*, although *Jiallanella* discloses an ethylene homopolymer having a density from 0.9 to 0.935 g/cm^3 , according to the introduction, a higher density polymer leads to highly deleterious loss of elongational properties. See *Jialanella*, column 3, lines 25-33. As a result, *Jialanella* appears to be contradictory, which does not provide any guidance to the skilled artisan. Further, this section of *Jialanella* provides insufficient guidance because it is not clear what has to be done with this higher density polymer and it is not clear why the homogeneous interpolymers require a comonomer, as they contain already comonomers. It is also not clear why their density has to be reduced to the range from 0.9 to 0.935g/cm^3 because they already have a density less than 0.910 g/cm^3 by definition. See *Jialanella*, column 1, line 14. Consequently, this section of *Jialanella* is unclear and the skilled artisan would receive no guidance from it.

As supported by the *Declaration*, the skilled artisan would conclude that *Jialanella* probably tried to claim his highly interesting nucleating agents that can increase the elongation at break by a factor of at least four (column 2, lines 20-23) for as many polymer compositions as possible and also for mixtures that actually are beyond the scope of his polymer compositions. On the other hand, the wax in *Jialanella* is only optional and mentioned together with other possible additives like tackifiers and plasticizers.

As supported by the *Declaration*, the interpolymers described by *Jialanella* are not suitable for e.g. injection molding applications that may be used to prepare castings as recited by

Claim 49. Injection molding typically requires harder materials. Furthermore, the skilled artisan would not injection mold coatings and adhesives because such materials require other techniques of application. The low onset of crystallization that is typical for the interpolymers described by *Jialanella* makes it economically unreasonable to process such interpolymers by injection molding where a fast crystallization is essential and parallels a high onset of crystallization.

As supported by the *Declaration*, the skilled artisan would understand *Jialanella* to be non-analogous art. The skilled artisan interested in improving polymers and polymer mixtures with improved processability and with maintained or improved mechanical properties suitable for e.g. injection molding processes would not try to find solutions in studying polymers used for adhesives and coatings as taught by *Jialanella*.

As supported by the *Declaration*, with the claimed polymer mixtures, the opposite was found of what is expected from reading *Jialanella*. The elongational properties were not deteriorated due to addition of wax and processability is improved. Moreover, the skilled artisan would find no guidance in *Jialanella* to realize the benefit of compatible waxes for injection molding applications of the claimed polymer mixture where, without the use of a nucleating agent and after sufficient mixing when the wax molecules are evenly distributed within the polymer and some essential structural requirements of the polymer and wax are fulfilled, a synergistic interaction of the wax and the polymer takes place upon cooling. This results in a macromolecular network that is created by a kind of crystallization where the resulting crystals are built from the polymer macromolecules as well as the wax molecules such that an improved processability can be combined with improved mechanical properties.

As supported by the *Declaration*, based on the disclosure of *Jialanella*, the skilled artisan would understand that the subject of *Jialanella* is to provide coatings and hot melt adhesives based on interpolymers with increased upper use temperature and increased onset of crystallization that is achieved by using a wax. While these hot melt adhesives have in spite of the highly deleterious effect of the wax particularly good elongational properties (e.g. high elongation at break), which is achieved by a nucleating agent, the skilled artisan would be surprised to find that hot melt adhesives comprising any olefin polymers, a nucleating agent and optionally a tackifier, plasticizer or wax are also a subject of *Jialanella*. See *Jialanella*, column 2, lines 24-29. Nevertheless, *Jialanella* provides no examples concerning such compositions.

Rather at column 15, line 50 to column 16, line 8, *Jialanella* describes such compositions by stating that the hot melt adhesives of his polymer composition may instead or in addition to the homogeneous ethylene polymer (the interpolymer) comprise any of a variety of traditional olefin polymers ranging from LDPE's with densities of $0.910 - 0.935\text{g/cm}^3$ to HDPE's with densities of $0.941 - 0.965\text{g/cm}^3$. The skilled artisan would be surprised that such polymers with a deleterious effect on elongational properties are now useful. Further, the skilled artisan would understand that such polymers are not practical in hot melt compositions because, unlike the wax, they increase the viscosity dramatically such that the hot melts are not liquids anymore.

As supported by the *Declaration*, *Baker-Hughes* discloses a polyethylene wax and suggests that it is suitable in the field of polystyrene foams. As the wax and the polystyrene polymer are chemically incompatible, no molecularly dispersed mixture can be obtained and heterocrystallisation is impossible. The skilled artisan would understand that in such mixtures a migration of the wax to the surface of the polymer blend is expected as it is typically (but in most cases undesired) the case for additives that should improve processability. This effect also becomes obvious from the fact that the waxes may be used for mold-release, which is due to a layer of wax at the surface of molded articles. Moreover, the skilled artisan would find that the essential specific requirements of the mixing process of the claimed polymer mixture are not disclosed or suggested by *Baker-Hughes*.

Applicants respectfully submit that the Patent Office has improperly applied hindsight reasoning by selectively piecing together teachings of each of the references in an attempt to recreate what the claimed invention discloses. As the Federal Circuit explained, "the mere fact that the prior art may be modified in the manner suggested by the examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." *In re Fritch*, at 1783-17. The claims must be viewed as a whole as defined by the claimed invention and not dissected into discrete elements to be analyzed in isolation. *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1548, 220 USPQ 303, 309 (Fed. Cir. 1983); *In re Ochiai*, 71 F.3d 1565, 1572, 37 USPQ2d 1127, 1133 (Fed. Cir. 1995).

In sum, the cited references alone or in combination fail to disclose or suggest each and every element of independent Claim 13. Moreover, the cited references fail to even recognize the advantages, unexpected benefits and/or properties of the polymer mixture in accordance with

the present claims. For at least the reasons discussed above, Applicant respectfully submits that independent Claim 13, along with the claims that depend from Claim 13, are novel, nonobvious and distinguishable from the cited references.

Accordingly, Applicants respectfully request that the rejection of the claims under 35 U.S.C. §103 be withdrawn.

Claims 38-41 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Jialanella* and *Baker-Hughes* in further view of the publication to Kokko ("*Kokko*"). Applicants respectfully submit that the patentability of Claim 13 as previously discussed renders moot the obviousness rejection of Claims 38-41 that depend from Claim 13. In this regard, the cited art fails to teach or suggest the elements of Claims 38-41 in combination with the novel elements of Claim 13.

For the foregoing reasons, Applicants respectfully request reconsideration of the above-identified patent application and earnestly solicit an early allowance of same. In the event there remains any impediment to allowance of the claims which could be clarified in a telephonic interview, the Examiner is respectfully requested to initiate such an interview with the undersigned.

Respectfully submitted,

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